



# Socializing in Mixed Reality

Tom Soderstrom, IT Chief Technology Officer

Jeanne Holm, Knowledge Management Lead

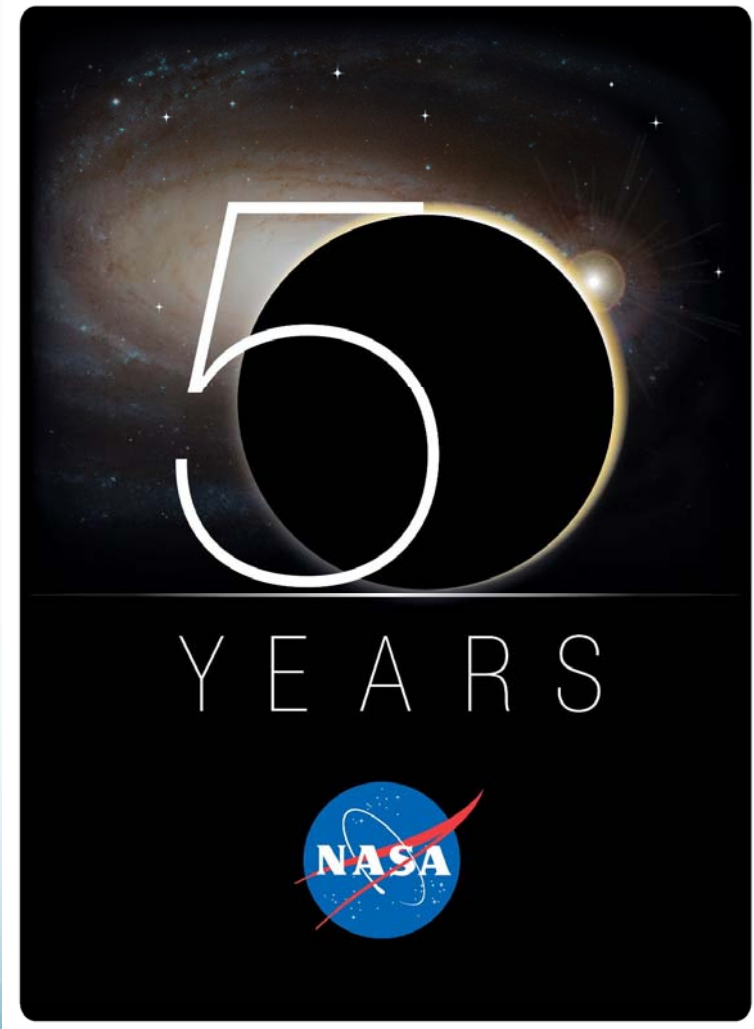
Jeanne Holm, Tom Soderstrom, and Charles White

NASA/Jet Propulsion Laboratory

California Institute of Technology

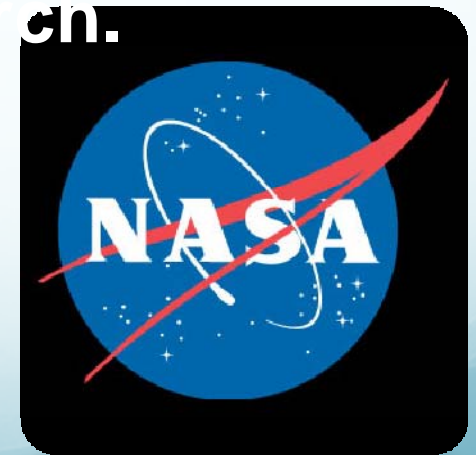
“Reality is nothing but an illusion...  
albeit a persistent one” -Albert Einstein

# NASA's "birthday" is October 1, 1958



**NASA's mission is  
to pioneer the  
future in space  
exploration,  
scientific  
discovery and  
aeronautics**

**research.**



# KM Pain Points for NASA

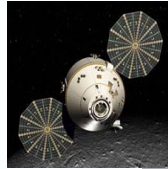


## Geographically Dispersed

- 10 centers in 8 states plus many other facilities
- 18,722 civil service<sup>1</sup>; 43,500 contractors/others<sup>2</sup>
- Constellation Program work is shared across all NASA centers

<sup>1</sup> As of August 2008,  
<http://wicn.nssc.nasa.gov/>

<sup>2</sup> Data as of June 2006, FAIR 2006



## Aging Workforce

- Long duration projects mean a high probability of team turnover
- Ave age<sup>1</sup>=46.4
- Ave federal service<sup>1</sup>= 17.9 years
- Eligible for Retirement<sup>1</sup> in '07=328

<sup>1</sup> For civil servants only,  
<http://wicn.nssc.nasa.gov/>



## Mission Transition

- Focus from Shuttle to Constellation means changes to buildings, workforce, contractors, and budget
- A 4 year gap between programs too!

# Generations Share Differently

- 1930-50's era generation
  - Focus on society
  - Friendships are forged through adversity
- 1960-70's era generation
  - Focus on community
  - Friendships forged through identification with a cause
- 1980-90's era generation
  - Focus on the individual
  - Friendships forged through individual goal accomplishment
- 2000's era generation
  - Focus on common interests
  - Friendships are created or thrive virtually...
- This leads us to the need to share across generations and communicate in different modalities

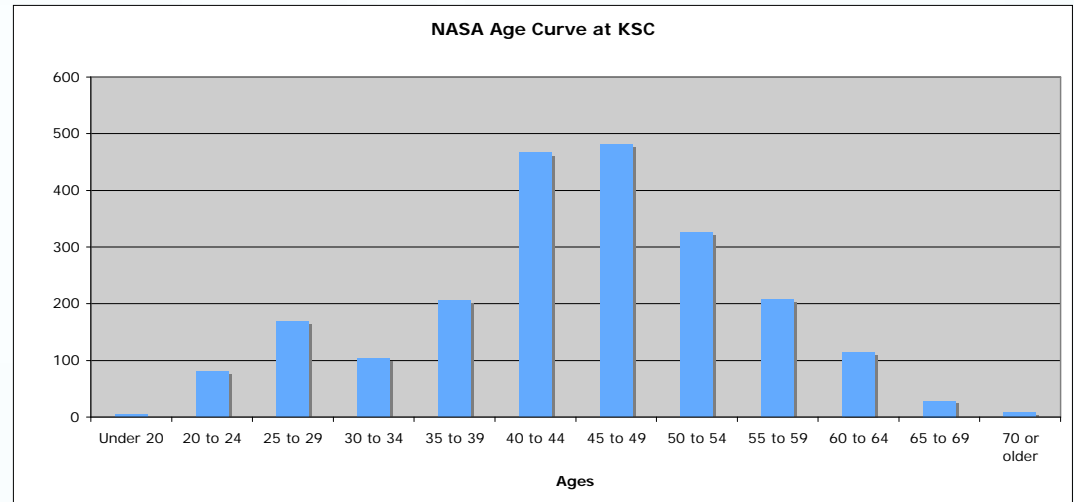




# Sample: KSC Workforce History and Projections

*Average aged worker in Apollo days was 27!*

Less than 2% of current NASA KSC employees in technical, science and engineering disciplines worked on the Apollo Program.



## Estimated NASA KSC Civil Servant Knowledge Loss Risk

Year	Average Losses	Knowledge Lost (Months)	Knowledge Lost (Years)	Knowledge Per Person
2009	95.48	21555.48	1796.29	18.81325932
2010	95.54	22116.29	1843.024167	19.29060254
2011	92.79	22084.35	1840.3625	19.8336297
2012	89.93	22104.31	1842.025833	20.48288484
2013	89.63	22912.84	1909.403333	21.3031723
2014	88.45	23228.05	1935.670833	21.88435086
2015	86.74	23712.15	1976.0125	22.78086811
<b>Total</b>	<b>638.56</b>	<b>157713.47</b>	<b>13142.78917</b>	<b>20.58191739</b>

KSC could experience post-Shuttle contractor workforce losses of 20-45%, based on TBD future requirements.

# Creating an Opportunity

- *Knowledge management activities provide the chance to look across an organization, regardless of boundaries, and find opportunities to make a difference...*

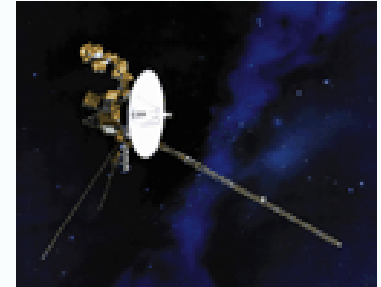


## NASA's Knowledge Management goal

Knowledge management is getting the right information to the right people at the right time, and helping people create knowledge and share *and act upon information in ways that will measurably improve the performance of an organization and its partners*

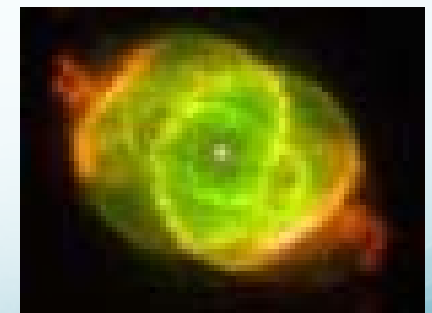
# Key Areas for NASA's KM Strategy

Sustain NASA's knowledge across missions and generations to identify and capture the information that exists across the Agency



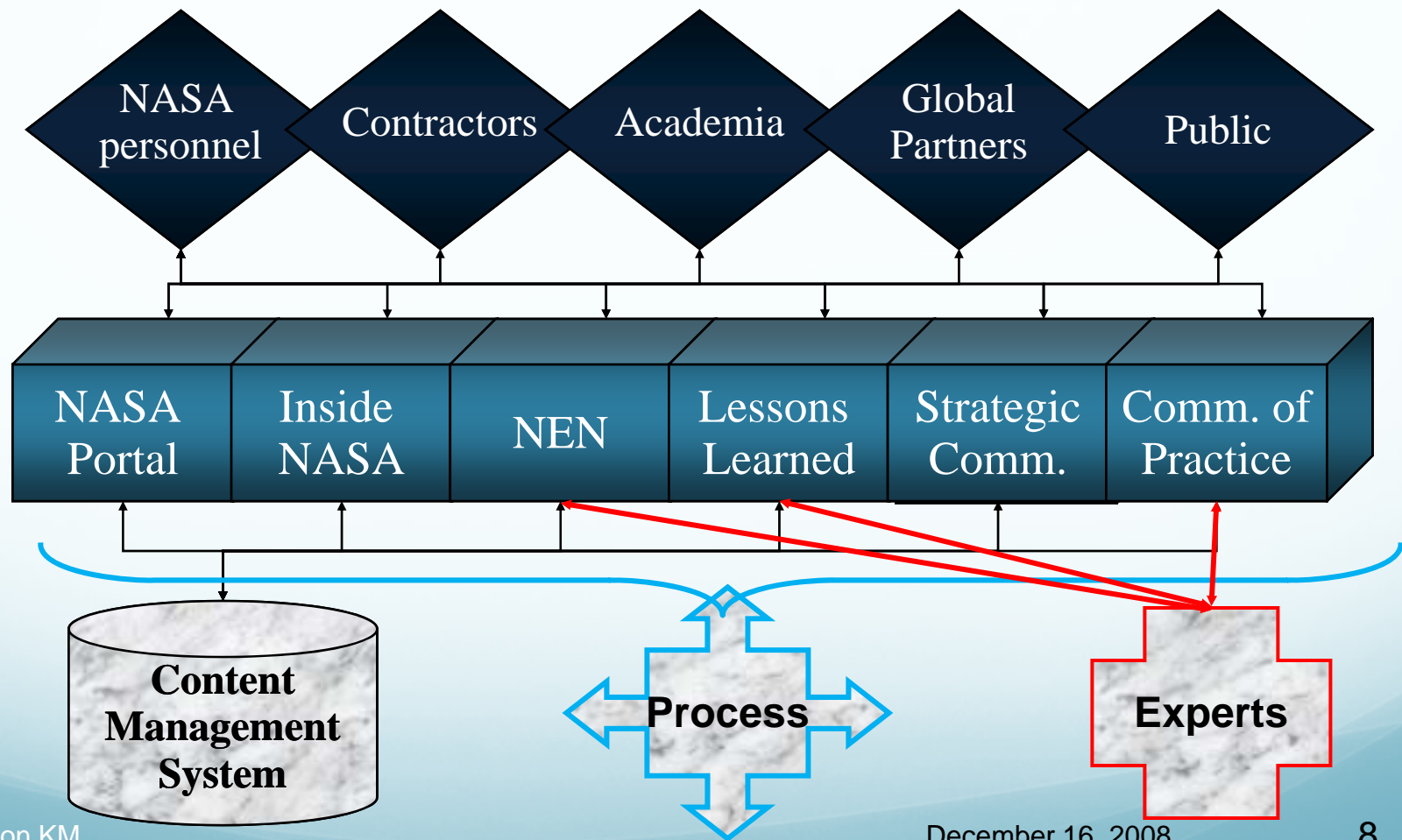
Help people find, organize, and share the knowledge we already have to efficiently manage NASA's knowledge resources

Increase collaboration and to facilitate knowledge creation and sharing to develop techniques and tools to enable teams and communities to collaborate across the barriers of time and space



# Knowledge Management Environment

- Integrating knowledge management into our engineering and project management lifecycle





# KM System Milestones

	2003	2004	2005	2006	2007
<b>Cus- tomers</b>	<ul style="list-style-type: none"> <li>• Public</li> <li>• Educators</li> </ul>	<ul style="list-style-type: none"> <li>• NASA personnel</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers</li> <li>• Project teams</li> </ul>	<ul style="list-style-type: none"> <li>• Disciplines</li> <li>• Communities</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers and partners</li> </ul>
<b>Stake- holders</b>	<ul style="list-style-type: none"> <li>• CIO</li> <li>• Public Affairs</li> <li>• Education</li> </ul>	<ul style="list-style-type: none"> <li>• CIO</li> <li>• Strategic Communications</li> </ul>	<ul style="list-style-type: none"> <li>• Engineers</li> <li>• Mission directorates</li> </ul>	<ul style="list-style-type: none"> <li>• Employees</li> <li>• Senior management</li> </ul>	<ul style="list-style-type: none"> <li>• Scientists</li> <li>• Peer-to-peer collaboration</li> </ul>
<b>System</b>	<ul style="list-style-type: none"> <li>• NASA Portal</li> <li>• KM for Space (U.N.)</li> </ul>	<ul style="list-style-type: none"> <li>• InsideNASA</li> <li>• Research Web</li> </ul>	<ul style="list-style-type: none"> <li>• NASA Eng. Network</li> <li>• Emergency ops</li> </ul>	<ul style="list-style-type: none"> <li>• Communities of practice</li> </ul>	<ul style="list-style-type: none"> <li>• InsideNASA v.2</li> <li>• Collab 2.0</li> </ul>
<b>KM Infra- structure (99.95%)</b>	<ul style="list-style-type: none"> <li>• O/S</li> <li>• Applications and storage</li> <li>• Hosting (VeriCenter)</li> </ul>		<ul style="list-style-type: none"> <li>• Caching (Akamai) and streaming</li> <li>• Service desk</li> <li>• Customization support</li> </ul>		
<b>Tools</b>	<ul style="list-style-type: none"> <li>• Digital Asset Management (eTouch), Vignette, Verity, Urchin</li> </ul>	<ul style="list-style-type: none"> <li>• +SunOne, WebEx, eRoom</li> </ul>	<ul style="list-style-type: none"> <li>• +NASA Xerox (NX), Jabber (instant messaging)</li> </ul>	<ul style="list-style-type: none"> <li>• +Semantic web, W3C standards, expertise locator</li> </ul>	<ul style="list-style-type: none"> <li>• +Social networking, Web 2.0, next-gen collaboration</li> </ul>

# The NASA Public Portal

- Designed as a dramatic, interactive interface to NASA by the public, kids, media, educators, and students, integrating web resources
- Our known challenges included
  - An evolving architecture, with a 4-week deadline for deployment
    - Highly interactive and engaging
    - Content migration from top NASA sites
    - Quick and easy navigation for our many audiences
- Our unknown challenge
  - Hours after deployment, Space Shuttle Columbia tragedy would occur
  - Redesign Portal immediately and supported outreach to the public
- Landings of the Mars Exploration Rovers on the Red Planet became the largest online event to date
  - Streaming live coverage, dynamic and distributed publishing, and automatic image upload brought fresh images within minutes of the spacecraft sending
- People reached: 240 million people in 2007

# Inside NASA

- For employees and partners
- Customizable
- Access to e-mail
- Secure instant messaging
- Collaborative tools
- Application integration
- Wikis and blogs (e.g. Shana Dale)
- People reached: >7500 per month accessing ~1.5M pieces of information

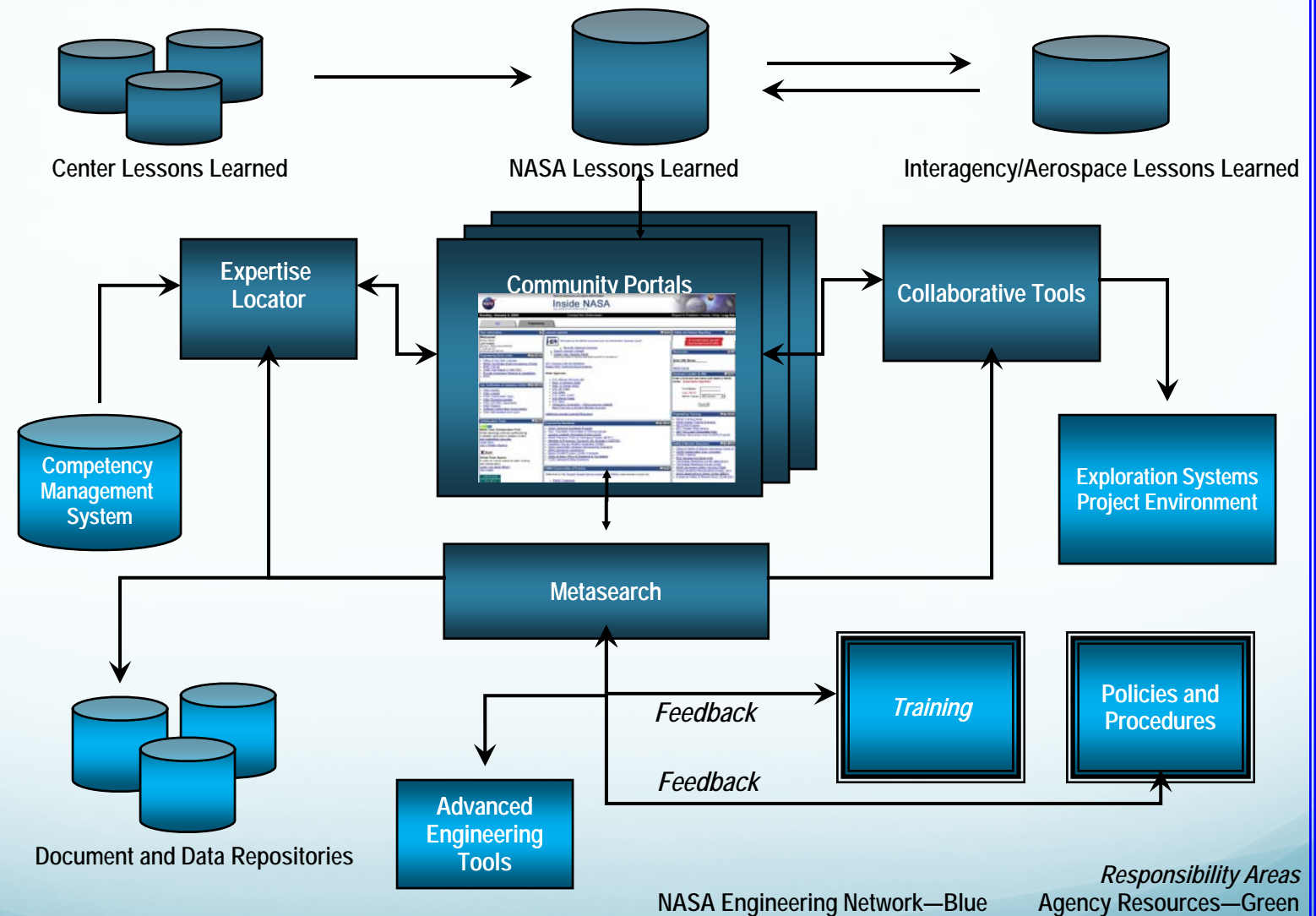
The screenshot displays the 'InsideNASA' website, which is designed for NASA employees and partners. The header includes the NASA logo, the site title 'InsideNASA', and navigation links such as 'Home', 'About', 'Contact', and 'Help'. A search bar is prominently featured at the top right.

The main content area is organized into several sections:

- Home:** Features a 'NASA Image of the Day' and a 'NASA-Wide Announcements' section with a list of recent news items.
- Administrator's Corner:** Includes a profile of the NASA Administrator, Michael Griffin, and a section for 'NASA Administrator's Q & A'.
- NASA News from Public Affairs:** A section for breaking news, including a 'NASA Breaking News' section with a list of recent headlines.
- The TSP Ticker:** A financial section displaying stock market data for NASA-related companies, including a table for 'FUND' and 'L 2040'.
- Local Forecast:** A section for weather information, including a map of the United States and a 'Local Forecast' section.
- NASA Management Calendars:** A section for various calendars, including a 'Council Information' calendar and a '2006 Calendar'.

The footer contains the NASA logo, the text 'National Aeronautics and Space Administration', and contact information for the Inspector General Hotline and the Editor, Jeanne Holm.

***Learning occurs when people can find and share knowledge easily and act upon it***



# Accessing and Gathering Lessons Learned

- Formal lessons are gathered from Centers and key reviews
- Lessons are vetted and validated
- Affected policies and procedures are changed as needed
- Subscriptions allow new lessons to come just in time
- Managed by Office of Chief Engineer (NEN)
- Led by Michael Bell, NASA KSC

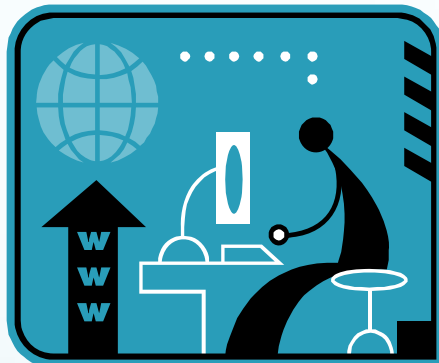
Built on same infrastructure as NASA's public Portal

The screenshot shows the NASA Lessons Learned Knowledge Network (LLKN) website. At the top, there's a NASA logo and the title 'LESSONS LEARNED KNOWLEDGE NETWORK'. Below this is a navigation bar with links: '+ ABOUT LLKN', '+ MY LLKN', '+ COMMUNITIES', and '+ EXPERT LOCATOR'. A search bar on the right says 'FIND IT @ LLKN' with a '+ GO' button and a link to '+ ADVANCED SEARCH'. The main content area is divided into several sections. On the left, there's a 'Find Lesson Learned By' sidebar with categories: '+ NASA CENTERS', '+ NASA ENTERPRISE', '+ CROSS CUTTING PROCESSES', '+ TOPICS', '+ BY YEAR', and '+ BY COLLECTION'. The main content area features a large banner with the text 'APPLYING PAST KNOWLEDGE FOR CURRENT AND FUTURE MISSION SUCCESS' and 'LESSONS LEARNED KNOWLEDGE NETWORK'. Below the banner, there's a welcome message: 'Welcome to the new Lessons Learned Knowledge Network. This online knowledge management system brings you NASA's official lessons learned as well as a variety of online knowledge management tools for discovering NASA's vast engineering resources.' There are also sections for 'LATEST LESSONS LEARNED' and 'LOG IN TO MY LLKN'. The 'LATEST LESSONS LEARNED' section lists two entries: one from 03/11/2004 about ATCS and PVATCS, and another from 03/11/2004 about ECLSS and the Russian Segment. The 'LOG IN TO MY LLKN' section has fields for 'Username:' and 'Password:', a '+ SIGN IN' button, and a 'WHY REGISTER?' section with links for 'Take a tour', 'Site Map', and 'Privacy Policy'. There's also a 'SUBMIT MY LESSONS' section with a link to 'I want to submit my Lesson Learned'.

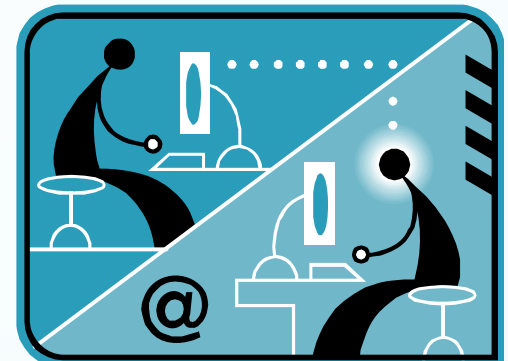
Lessons are solicited from academia, industry, and global partners



# APPEL Community of Practice (Academy of Program and Project Engineering Leadership)



Class preparation



Discussions and  
course follow-up

Led by Dr. Ed Hoffman, NASA HQ

# APPEL Community of Practice

**NASA Engineering Network**

Welcome to NEN

**APPEL**

Main Page | Course: IDEAs (Logistics (KSC)) | PI Team Masters Forums

**APPEL Benefits for Engineers**

The Academy of Program/Project & Engineering Leadership offers several services of value to NASA engineers.

- APPEL develops the Agency's technical workforce through a competency-based model that identifies learning experiences and activities that should take place at each career level.
- The Academy offers a **training curriculum** focused on providing NASA-specific expertise to ensure that the technical workforce shares a common base of knowledge and skills.
- APPEL offers **direct support to project teams** through assessment, workshops, expert consulting, rapid deployment training, coaching, and mentoring.
- The Academy facilitates the dissemination of lessons learned and best practices through **knowledge sharing** activities, including conferences, forums, publications, case studies, and communities of practice.
- Finally, APPEL supports NASA's goal to **bridge programs/projects and the academic community**. Many partnerships, studies, research and workshops are planned to share knowledge between program/project practitioners and university researchers.

**System Engineering Forum Feedback Form**  
August 21, 2009  
Johnson Space Center

The System Engineering Forum Feedback Form can be downloaded here. Your feedback will help us make improvements to future Forums and to follow up on this one! Please submit the form to Kasei Robinson (Kasei.Robinson@nasa.gov).

**Announcements (APPEL)**

- 35C Systems Engineering Forum**  
13-Aug-2009 35C Systems Engineering Forum  
DATE: Thursday, August 21, 2008  
TIME: 1:00 pm - 3:00 pm CST  
PLACE: 35C South Center, Alamo Ballroom  
NASA: Friday, August 22, 2008  
Successful Constellation Program at NASA will require the application of superb system engineering competencies. Currently, we face unique system engineering challenges...read more  
Submitted by **Ellie Trevarthen (for Dana Topoulis)** at Jet Propulsion Laboratory
- Master's Forum #17, Oct. 27-30, 2008**
- New Counsel Design for Manufacturability and Assembly**

View all Announcements | Submit an Announcement |

**APPEL Curriculum**

APPEL courses are designed using project management and systems engineering competency models. They focus on what participants will need to enhance their capabilities, knowledge and skills. An integral component is pre- and post-assessments designed to identify strengths, depth of knowledge, knowledge gaps, and knowledge gain.

The APPEL curriculum consists of a suite of core courses and a wide array of in-depth courses. The courses combine with outside-the-classroom development experiences to reinforce learning and provide an additional means of obtaining requisite skills.

**Core Curriculum**

- Executive Program (EXEC)
- Advanced Project Management and Advanced Systems Engineering (APM & ASE)
- Project Management and Systems Engineering (PMSE)
- Foundations of Aerospace at NASA (FOU)

**In-Depth Courses**

The Academy sponsors in-depth courses in program/project management and systems engineering, communications and leadership, courses related to NASA's mission and vision, as well as other experiential learning activities. These courses provide supplemental development for achieving current and future job requirements and augment the knowledge and skills gained in the Core Curriculum. In-depth courses are made available to the NASA Centers, but students are not limited to attending courses at their home Center. Dates and locations can also be found on the Agencywide Training Master Schedule.

>>> How to Register for APPEL Courses <<<

**About APPEL**

As a Division of the NASA Office of the Chief Engineer, the Academy of Program/Project & Engineering Leadership (APPEL) contributes to NASA's mission by promoting individual and team excellence in program/project management and engineering through the application of learning strategies, methods, models, and tools. It supports individual practitioners as well as NASA project and program teams at every level of development through its four primary business lines: **Curriculum, Knowledge Sharing, Performance Enhancement, and Research and Advanced Concepts.**

We present an introduction to APPEL resources here and invite you to visit **APPEL** to learn more.

**Contact:**  
COTR: Roger Forgyren  
Facilitator: Dana Topoulis

**Knowledge Sharing Initiative (APPEL)**

APPEL's Knowledge Sharing Initiative promotes excellence in project management and engineering leadership development. It has proven to be an effective catalyst in building and supporting NASA communities of practice. Forums, conferences, publications, and multimedia provide NASA managers and engineers with examples and lessons learned, while leading teams through the various steps of project management.

- Semiannual **Masters Forums**
- Annual **PM Challenge Conferences**
- Award-winning **ASK Magazine**
- Monthly newsletter **ASK the Academy**
- Robust case studies
- Video clips of leading thinkers and practitioners

**ASK Magazine / Browse by Lesson Learned Topic**

When clicked, the following links will open in your active browser window or tab. Use your browser's Back button to return to the NASA Engineering network.

Lesson Name	Lesson Name
(Work) Environment	Mentoring
Budgets	Partnerships
Challenging the Status Quo	Planning
Change	Politics
Communication	Professional Growth
Coping with Failure/Loss	Prototyping / Innovation
Culture	Recruiting
Delegating	Requirements
Humor and Fun	Reviews
International Collaboration / Communication	Risk
Knowledge Sharing and Storytelling	Scheduling
Leadership	Teams
Learning from Failure	Testing
Management and Collaboration	Trust
Meetings	

**Timely Announcements**

**Key documents**

**Curriculum**

NASA National Aeronautics and Space Administration

Inspector General Hotline - 1-800-424-9183 | Equal Employment Opportunities | Dispute Resolution | Freedom of Information Act | Privacy Policy and Important Notices

NEN V 2.0

Editor: Manson Yew  
NASA Official: Gregory Robinson  
Contact NEN

# APPEL IDEA's Course Community

**NASA Engineering Network**

Welcome to NASA NES

NEW Round

Lessons Learned

Engineering Experiences

Engineering Research

Program/Project

Office of the Chief Engineer

APPEL

APPEL

Logistics (XEC)

AP Team Member Forum

NESC

PODS Expertise (Logistics)

About Us

APPEL > Course: IDEAS

**APPEL**

Main Page | Overview | IDEAS | Logistics (XEC) | AP Team Member Forum

**Course Overview (IDEAS)**

Designed for NASA's technical audience, including systems engineers and project personnel involved in project teams or small projects, this three-day course will provide a comprehensive overview of the APPEL process and the importance of the APPEL process in ensuring successful completion of the course. Through integrated in-class projects focused on hardware design and system performance, participants will be able to:

- Describe common innovation practices and methods.
- Demonstrate different modes of thinking in creative (e.g., physical or resource planning).
- Identify sources for creativity, theories such as reframing, lateral and customer.
- Reduce the lead and cost side of innovation and how to integrate the right side of innovation.
- Demonstrate the methods of designing for the user, including human factors, ergonomics, and user identification.
- Apply general problem-solving techniques for the user.
- Explain general problem-solving techniques for the user.
- Identify tools that have improved reliability, volume errors and cost, speed/manufacturability and assembly (error proofing).
- Design general innovation or reliability and how they are at NASA.
- Apply best practices obtained from other NASA designs (reference listed below as past projects).

>>> Register for APPEL IDEAS <<<

Access Materials (APPEL IDEAS)

03/27/2017 - July 9-10, 2008 APPEL IDEAS Course

The first APPEL IDEAS course will be offered at the KSC Learning Building July 9-10, 2008. Click "Logistics (XEC)" in the left navigation panel for more information.

> Home > U.S. > NES >

**Course Materials (APPEL IDEAS)**

**Innovative Design for Engineering Applications (IDEAS)**

Type Title Owner Edited Date

File Course Readings 06/04/08 7:10

Course Description (IDEAS) 06/07/08 12:43

Target audience, Role, Objectives, Learning Methods 06/07/08 12:43

Logistics (XEC) 06/07/08 12:43

Map, Direction, Getting Directions, Points of Interest, Accommodations, Attractions

**APPEL IDEAS Class Roster, July 9-10, 2008**

Name	Affiliation	E-mail Address	Phone
Instructional: John T. Starnick	Calcraft Consulting, Inc.	John.Starnick@calcraftconsulting.com	781-274-8359
Instructional: Anthony Leach	OSU State University	Anthony.Leach@osu.edu	614-292-4474
Instructional: David Anttila	Calcraft Consulting, Inc.	David.Anttila@calcraftconsulting.com	617-636-2492
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William S. Dearing	KSC	William.S.Dearing@nasa.gov	321-867-2200
Christopher D. Desjardine	KSC	Christopher.D.Desjardine@nasa.gov	321-867-2762
Richard D. Fine	KSC	Richard.D.Fine@nasa.gov	321-867-6213
Orlando R. Forster	KSC	Orlando.R.Forster@nasa.gov	321-861-4476
Sean H. Hill	KSC	Sean.H.Hill@nasa.gov	321-861-7472
Anna H. Jacoby	KSC	Anna.H.Jacoby@nasa.gov	321-861-2924
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Stephen J. O'Brien	KSC	Stephen.J.O'Brien@nasa.gov	321-867-1616
Deborah B. Rouse	KSC	Deborah.B.Rouse@nasa.gov	321-867-2556
James Ramirez	KSC	James.Ramirez@nasa.gov	321-867-7894
Lucretia B. Robinson	KSC	Lucretia.B.Robinson@nasa.gov	321-867-1263
Vicki Stronach	KSC	Vicki.Stronach@nasa.gov	321-867-6564
James D. Stille	IMPSC	James.D.Stille@nasa.gov	321-867-7623
David J. Smith	KSC	David.J.Smith@nasa.gov	321-861-2991
Paul A. Tatum	KSC	Paul.A.Tatum@nasa.gov	321-867-1369
Tyler A. Telle	KSC	Tyler.A.Telle@nasa.gov	321-867-4330
Tyler A. Telle	KSC	Tyler.A.Telle@nasa.gov	321-867-4330
Brian J. Wetherman	KSC	Brian.J.Wetherman@nasa.gov	321-867-6468
David A. Williams	KSC	David.A.Williams@nasa.gov	321-867-0558

**APPEL IDEAS Overview**

Below are discussion forums related to the APPEL IDEAS course. Click a forum title to open the forum and participate in a discussion.

Forum There are no topics to display

All Forums

Feedback on APPEL IDEAS Course

Please click on what you think! Select a topic from the drop-down menu, add your comment or suggestion, and click Submit.

Suggestion topics

Make this forum anonymous

Submit

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Editor: Mission View  
NASA Official: Gregory A. Johnson  
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## Site Logistics

## Instructors' Bio

## Discussion Board

## Course objectives

## Course Materials

Course participants  
(integrated w/ Saturn)

# APPEL Principle Investigator Forum

TV | NASA Engineering
Customer Support | Site Map | Login | Register

# NASA Engineering Network

Welcome to New ENN

- NEW Home**
- Lessons Learned
- Engineering Communities
- Engineering Resources
- Program/Project Management
- Office of the Chief Engineer
- APPEL
- Coverage IDEAs
- Logistics (KSC)
- PI Team Masters Forum
- MISC
- ROPS Expertise Locator
- About the Network
- InnovateNASA

**APPEL > PI Team Masters Forum**

**APPEL**  
[Home Page](#) ([Overview](#), [IDEAs](#), [Logistics](#)) ([KSC](#)) ([PI Team Masters Forum](#))

**PI Team Masters Forum Objectives:**  
 This forum features top Principal Investigators, Program/Project Managers, Project Scientists, Systems Engineers and other key leaders from many outstanding space science missions. It allows sharing of stories, experiences, and lessons learned to help facilitate a successful outcome for the new SMD mission. The objectives of the APPEL PI Team Masters Forum are:  

- Develop a working knowledge of the PI Team roles and responsibilities.
- Provide an understanding of the primary policies, directives and processes that govern the development and operations of NASA science organizations.
- Provide an appreciation of the project management and systems engineering approach.
- Highlight the importance of leadership skills.

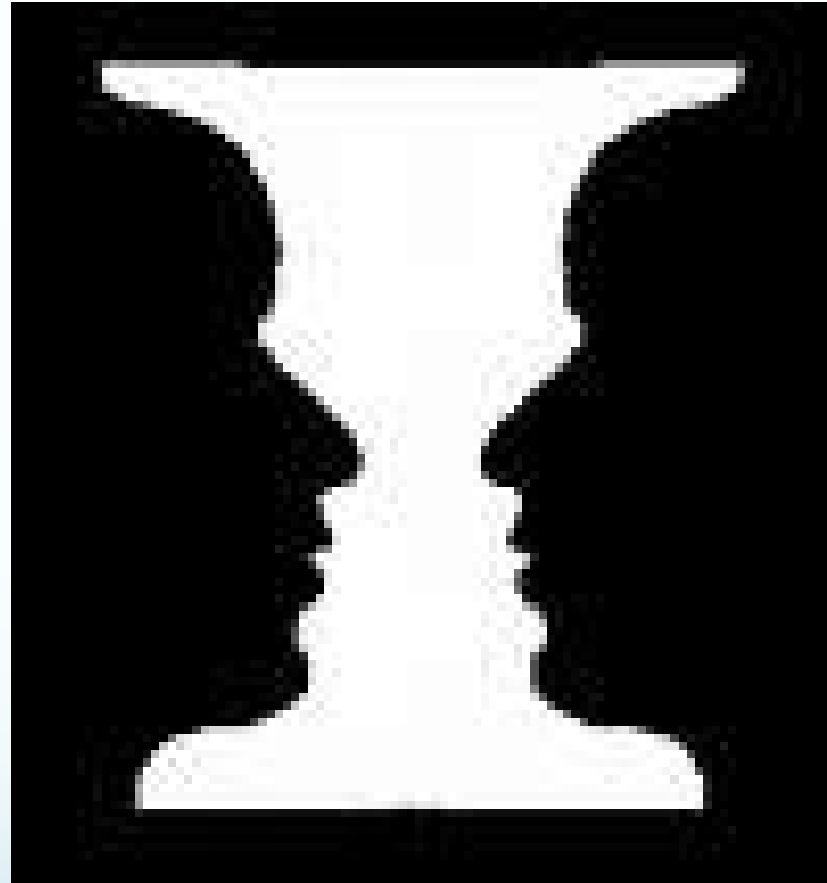
**PI Team Masters Forum #1 Logistics**  
 APPEL's PI Team Masters Forum #1 will be held Tuesday through Thursday, August 5-7, 2008, preceded by an introductory dinner Monday, August 4.  
**Meeting Venue:** Please mention "APPEL Forum" when making accommodations.  
 Annapolis Marriott Waterfront  
 10 Corporate Drive  
 Annapolis, Maryland 21403  

- Dinner Reservations
- Toll-free Telephone Reservations: 800-228-8280
- Hotel Room Number: 888-773-0786
- Maps and Directions

**Photos from the Boat Ride:**  
 Below are some of the images taken from the boat ride. Click the thumbnail to see full image.
 

<

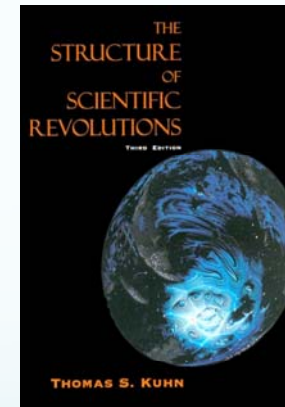
# Paradigm Shift





# Defining the Competitive Edge

- One of the most powerful aspects of understanding social networks in an organization or field is to see how to connect several together
- Historically, innovation and breakthrough ideas and technologies occur at the edges and boundaries of networks
- Thomas Kuhn's *The Structure of Scientific Revolutions* describes such radical innovation as a paradigm shift
  - Astronomy: Ptolemy to Copernicus
  - Biology: Creation to Darwinian evolution
  - Politics: English monarchy to Magna Carta
- Where will your innovation occur?
- “Networks of the Moment”
- A challenge many organizations face is how to manage the flow of critical information during a crisis, when traditional social networks are insufficient or break down



# Baby Boomers to Gen X to Gen M



- Socialization now occurs primarily online for the age group 6 through 30
- As the sales of sports video games increases, the number of people watching sports decreases?
  - What does this say about how people are choosing to interact with reality? How do we take virtuality and bring people closer to the experience of space exploration?

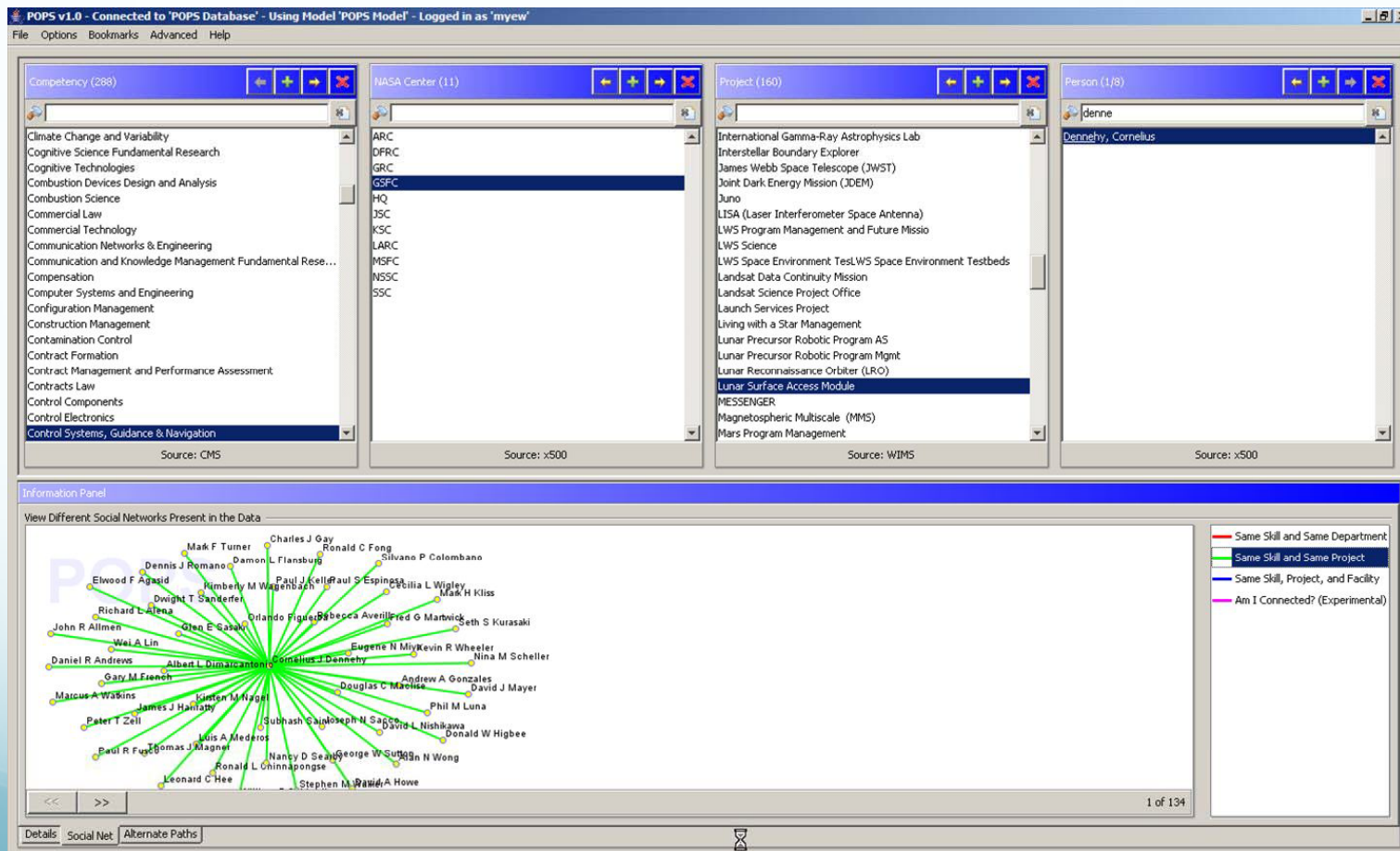
# Discovering Knowledge in New Ways

- Semantic SEEK
  - Searching engineering expertise and knowledge (MIT, Sir Tim Berners-Lee)
    - Semantic query to dynamically integrate distributed content and context
    - Focusing on lunar mission data from international partners
- Explorer Island--Second Life immersive avatar-driven environment for collaboration and engineering
  - Mission support (modeling and simulation, collaboration, proposal development, and more); outreach; education; and training



# POPS Expertise Locator

- Semantic technology to find people through search and social connections
- Led by Andy Schain, NASA HQ



2008 December 10



# Social Networking – NASAsphere pilot

NASAsphere is online social network that enables employees to move across physical boundaries established by disparate locations of centers, to move across traditional communication boundaries established by organizations, and to move outside personal networks, in order to share and foster collective intelligence for the betterment of conducting NASA business.

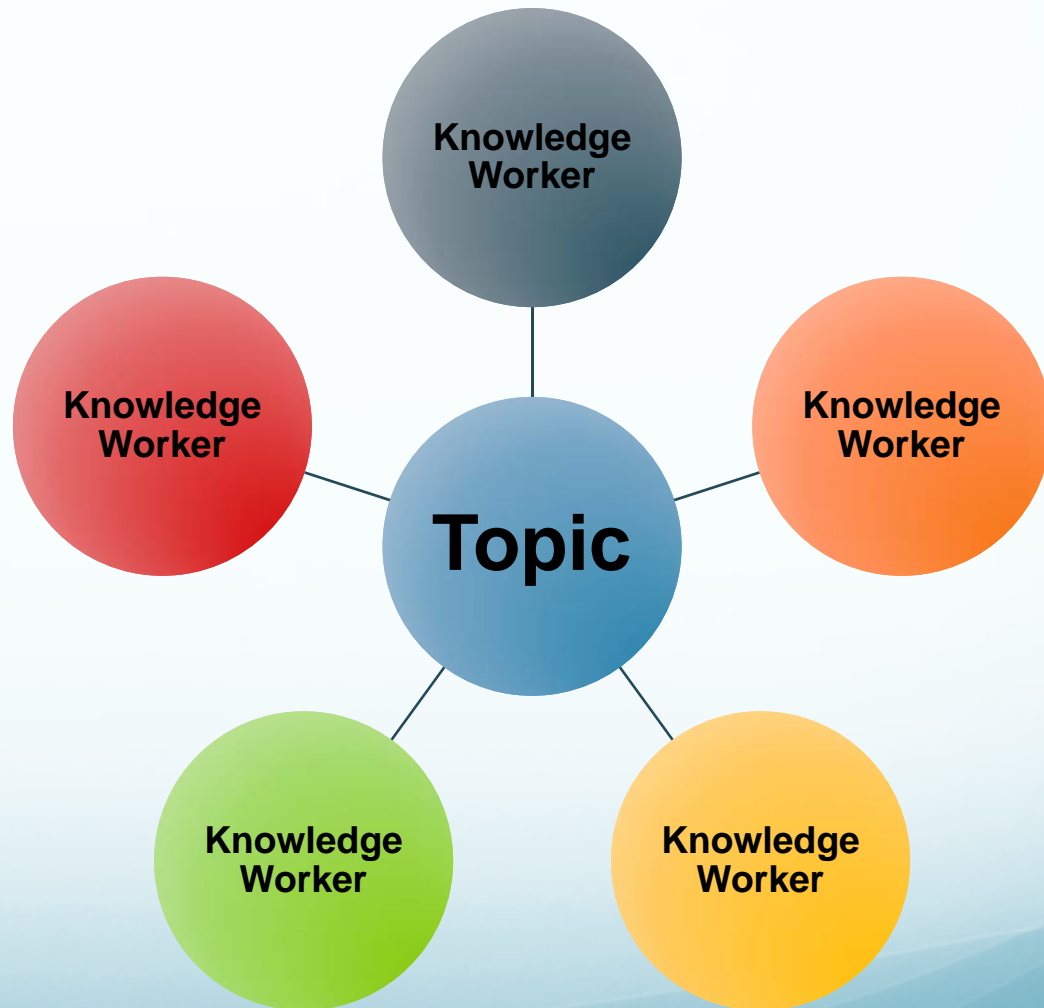
The screenshot shows the NASAsphere pilot website interface. The header includes the NASAsphere logo with the tagline "Socializing, Innovating, Inventing" and navigation links for Profile, edit, Ideas, Questions, Pages, Groups, News, Dashboard, Admin, Help, and Log out. The main content area is titled "Welcome, Celeste" and features a "What Are You Doing?" section with a text input field, an "Update!" button, and a checkbox for "Add this to my Worklog". Below this is a "WELCOME" message and a "Dismiss welcome page" button. The left sidebar contains a search bar, a section for "I'm Currently:" with a text input field, an "Invite Your Colleagues" section with a button for "7 invitations remaining", and a "Quick Contacts" list with user avatars and names. The right sidebar contains three sections: "GET STARTED" with links for updating profile and integrating with blog and bookmarks; "GET INVOLVED" with links for posting ideas and answering questions; and "GET CONNECTED" with links for finding colleagues in the NASA Jet Propulsion Laboratory and the Office of the Chief Information Officer.



# Social Networking

## How NASAsphere Works

“The network of a conversation spreads based on its topic rather than by person-to-person sharing.” ~ NASAsphere participant



# Social Networking Benefits to NASA



Accelerates  
communication and  
problem solving,  
creating peer-to-peer  
communication  
capability



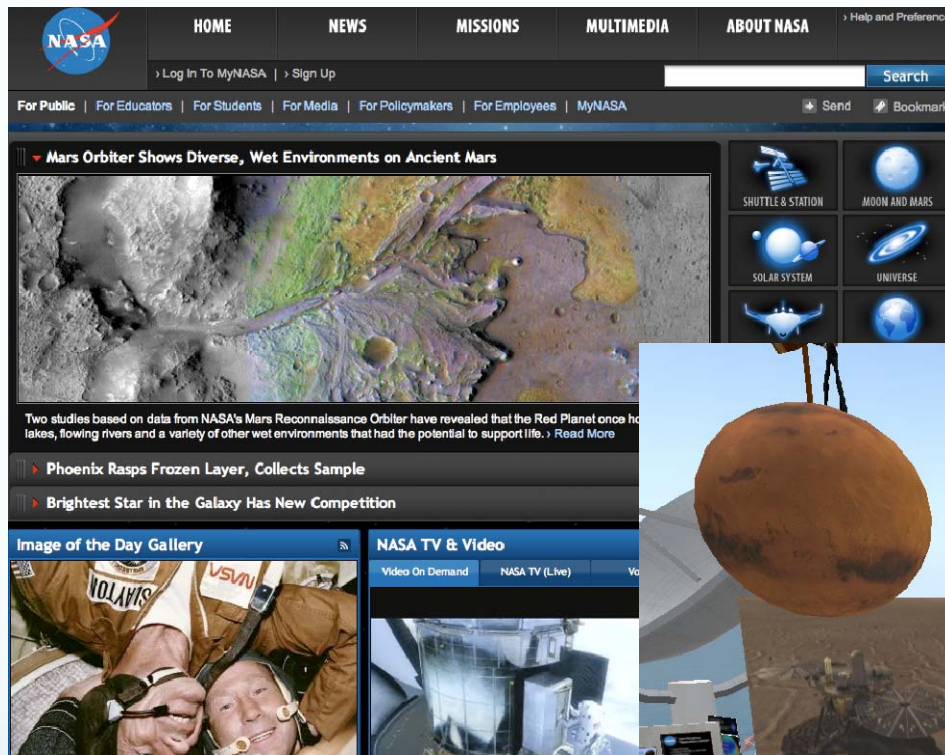
Captures individual  
knowledge worker  
know-how for reuse by  
many, creating collective  
intelligence



Creates peer-to-peer  
communication in  
context, deepening  
understanding for  
decision making




# Sharing the Excitement of Discovery





# Creating the Basis for Transformation

Profile edit Friends ▾ Inbox (1) ▾ home account privacy logout



**Phoenix Mars Lander**  
used my rasp (motorized drill) to get some ice shavings. Who's up for a snowcone? :)  
Updated on Wednesday

Networks:  
Arizona Staff  
Texas A&M Staff  
Tucson, AZ

Sex: Female  
Birthday: May 25  
Hometown: Tucson, AZ

Mini-Feed  
Displaying 10 stories See All

Yesterday

- Phoenix and Karen Stover are now friends. 6:00pm Comment
- Phoenix added the The Wonders of the Universe application. 4:40pm Comment
- Phoenix and Lisa McGill are now friends. 4:39pm Comment
- Phoenix and Megan Hively are now friends. 4:39pm Comment
- Phoenix and Rapid Eye are now friends. 1:46pm Comment
- Phoenix and Alex Kirk are now friends. 1:46pm Comment
- Phoenix and Anthony Armstrong are now friends. 12:05pm Comment
- Phoenix and Challenger Center are now friends. 11:03am Comment
- Phoenix and Ellen Cohen are now friends. 10:57am Comment
- Phoenix and Mike Generale are now friends. 10:30am Comment

▼ Mutual Friends  
44 friends in common See All

▼ Arizona Friends  
49 friends at Arizona See All

Sam Asaki Joshua Nelson Kristin Block  
Stephanie Amanda Ingrid Daubar

**Contact Info**  
Webs to:  
http://phoenix.jpl.arizona.edu  
http://www.nasa.gov/mission\_page  
http://www.jpl.nasa.gov/news/phc  
http://www.met.tamu.edu/mars/  
http://www.space.gc.ca/asc/eng/e  
http://www.nbi.ku.dk/forskning/gi  
http://www.mps.mpg.de/en/proj

**Personal Info**  
Activities: -taking pictures with my Surface St

LIBRARY  
Music  
Movies  
TV Shows  
Podcasts  
Audiobooks  
Radio  
Ringtone

STORE  
iTunes Store  
Purchased  
Downloads

PLAYLISTS

PODCASTS

- Science @ NASA Feature Stories Pod...  
National Aeronautics and Space Administ...  
Category: Natural Sciences  
Free SUBSCRIBE
- Hidden Universe HD: NASA's Spitzer ...  
NASA's Spitzer Science Center / NASA J...  
Category: Natural Sciences  
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National Aeronautics and Space Administ...  
Category: Science & Medicine  
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National Aeronautics and Space Administ...  
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NASA Goddard Space Flight Center  
Category: Natural Sciences  
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Sky and Telescope  
Category: Podcasts  
Free SUBSCRIBE
- NASACast: This Week of NASA Video  
National Aeronautics and Space Administ...  
Category: Natural Sciences  
Free SUBSCRIBE
- HD - NASA's Jet Propulsion Laboratory  
High Definition Video  
Category: Science & Medicine  
Free SUBSCRIBE
- NASACast: Space Shuttle and Space ...  
National Aeronautics and Space Administ...  
Category: Natural Sciences  
Free SUBSCRIBE
- NASA's Jet Propulsion Laboratory Vid...  
Video and audio podcasts  
Category: Science & Medicine  
Free SUBSCRIBE
- NASA 80th Anniversary Moments Pod...  
National Aeronautics and Space Administ...  
Category: Science & Medicine  
Free SUBSCRIBE
- NASACast: Universe Video  
National Aeronautics and Space Administ...  
Category: Natural Sciences  
Free SUBSCRIBE
- NASA Aeronautics Research T...  
NASA Aeronautics Research Mission Dir...  
Category: Natural Sciences  
Free SUBSCRIBE
- Cloncia @ NASA  
National Aeronautics and Space Administ...  
Category: Natural Sciences  
Free SUBSCRIBE
- Hubblecast  
NASA/Hubble  
Category: Natural Sciences  
Free SUBSCRIBE
- NASACast: This Week @NASA Audio  
National Aeronautics and Space Administ...  
Category: Natural Sciences  
Free SUBSCRIBE
- Ask an Astronomer Videos  
NASA's Spitzer Science Center and Infrar...  
Category: Natural Sciences  
Free SUBSCRIBE
- NASA Student Opportunities  
National Aeronautics and Space Administ...  
Category: Education  
Free SUBSCRIBE

Now.. I still have some other milestones ahead. Solar panels will open in 15 minutes after the dust has settled here. [about 3 hours ago from web](#)

Cheers! Tears!! I'm here! [about 3 hours ago from web](#)

I've landed!!!!!!!!!!!!!! [about 3 hours ago from web](#)

come on rocketssssss!!!! [about 3 hours ago from web](#)

parachute is open!!!! [about 3 hours ago from web](#)

parachute opening is scariest part for the team. [about 3 hours ago from web](#)

parachute must open next. my signal still getting to Earth which is AWESOME! [about 3 hours ago from web](#)

Peak heating will hit in 40 seconds. The heat and energy generated during atmospheric entry would be enough to power 280,000 homes [about 3 hours ago from web](#)

Atmospheric entry has started. time to get REALLY nervous. Now I'm in the "seven minutes of terror." [about 3 hours ago from web](#)

# Speaking Out and Speak Up



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**NasaTVThisWeek**  
 Released April 18, 2008  
 I just Sign In: 1 week ago  
 Views: 286  
 Subscribers: 82  
 Unsubscribed Views: 1,065

Carl Sagan played a leading role in every single one of NASA's missions of exploration from the beginning of the space age until his death in December 1996.

GAUL SAGAN: ("Cosmos" 1980) The size and age of the Cosmos are beyond ordinary human understanding. Lost somewhere between immensity and eternity is our tiny planetary home, the Earth, not the first time we have the power to decide the fate of our planet and ourselves. This is a time of great danger, but our species is young and curious and brave. It shows much promise. In the last few millennia we have made almost astonishing and unexpected discoveries about the cosmos and our place within it. I believe our future depends powerfully on how well we understand this cosmos in which we float like a mote of dust in the morning sky.

We're about to begin a journey through the cosmos. We'll encounter galaxies and stars and planets, life and consciousness coming into being, evolving, and perishing, worlds of ice and stars of diamond, atoms as massive as suns and universes smaller than atoms. But it's also a story of our own planet, and the plants and animals that share it with us, and it's a story about us, how we achieved our present understanding of the cosmos, how the cosmos has shaped our evolution and our culture and what our fate may be. We wish to pursue the truth no matter where it leads, but to find the truth, we need imagination and skepticism both. We will not be afraid to speculate, but we will be careful to distinguish speculation from fact. The cosmos is full beyond measure of elegant truths, of exquisite interrelationships, of the awesome machinery of nature.

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The Exotic World of Neutron Stars

From: [Cosmos: The New Frontiers](#)

Views: 624

Comments: 1

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## NASA Lecture Series

On Monday, April 21, I attended the NASA Lecture Series, another venue to celebrate NASA's 50th anniversary. World-renowned physicist Stephen Hawking, Ph.D., delivered a wonderful lecture on the importance of human space exploration now and for the next few hundred years. For more information about this event visit [NASA Lecture Series - Professor Stephen Hawking](#). It was a special honor for me to meet Stephen Hawking and his delightful daughter, Lucy.



Left to right: Lucy Hawking, Dr. Stephen Hawking, Shana Dale (Photo credit: NASA)

Lucy spoke for a few minutes about the book she co-authored with her father, entitled *George's Secret Key to the Universe*. The book is meant to inspire children to pursue their interest in space and science. Another theme that Dr. Hawking mentioned — humorously, I might add — was one that Mike Griffin and I have spoken about on several occasions — the Space Economy.

Dr. Hawking emphasized the point that no one alive in the late 1400s could have imagined all of the wonderful things, "like a Big Mac or a KFC," that our society would have a few hundred years later as a result of the discovery of the New World. While fast-food restaurants were clearly a tongue-in-cheek reference, it nevertheless illustrated his point about unforeseen advancements stemming from human endeavors. Similarly, we cannot comprehend even a small percentage of what miraculous developments and discoveries that will inevitably be a part of our solar system and beyond.

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giving his NASA Lecture Series speech. Photo

own as one of the most brilliant and astrophysicists of our time, is an emphatic and vocal proponent of space exploration — perhaps the single most important factor that has propelled our society forward. Dr. Hawking's sense of what it means for human beings to explore the unknown, to always keep the next frontier, and to always keep making life better for future generations.

of Dr. Hawking's lecture is particularly inspiring at NASA, who are charged with boldly pushing the boundaries of what has gone before.



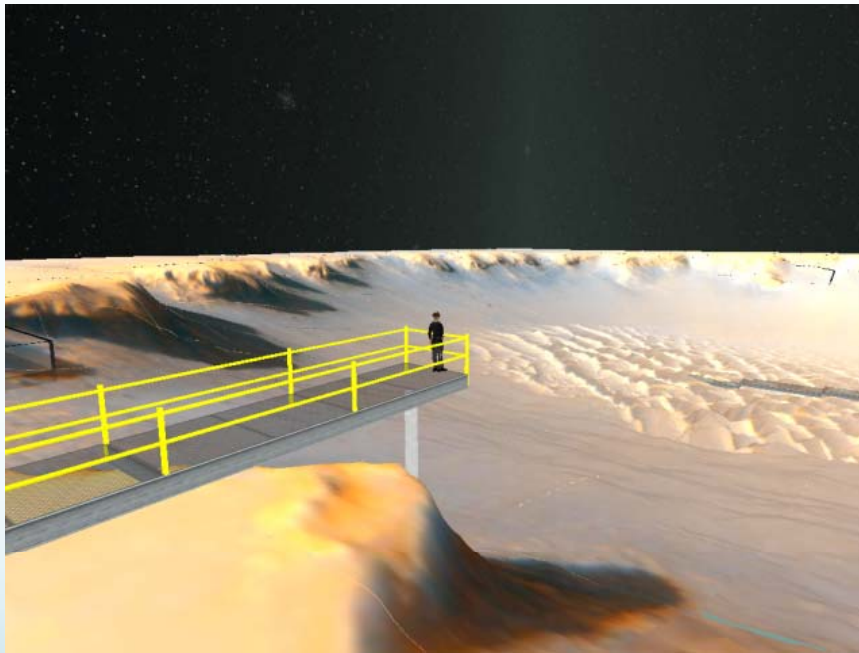


# Influence = Changing Policies



# Participate = Crowd Sourcing Real Science

- Being a virtual astronaut
- Searching for micrometeoroids with Stardust



# New Technologies in a Flight Mission (Phoenix)



1<sup>st</sup> pix from Phoenix

Remote  
Face-to-  
Face  
Concept  
Validation  
for  
Phoenix  
Project



twitter

“(About 3 hours ago from web in reply to KeithCowing)  
- Looking forward to moving arm today. Will  
bend the wrist and flex the elbow. It's been  
stowed for 10 months so I'll move it slowly...”



Phoenix landing in Second Life in real time

Next-Generation KM

Blog



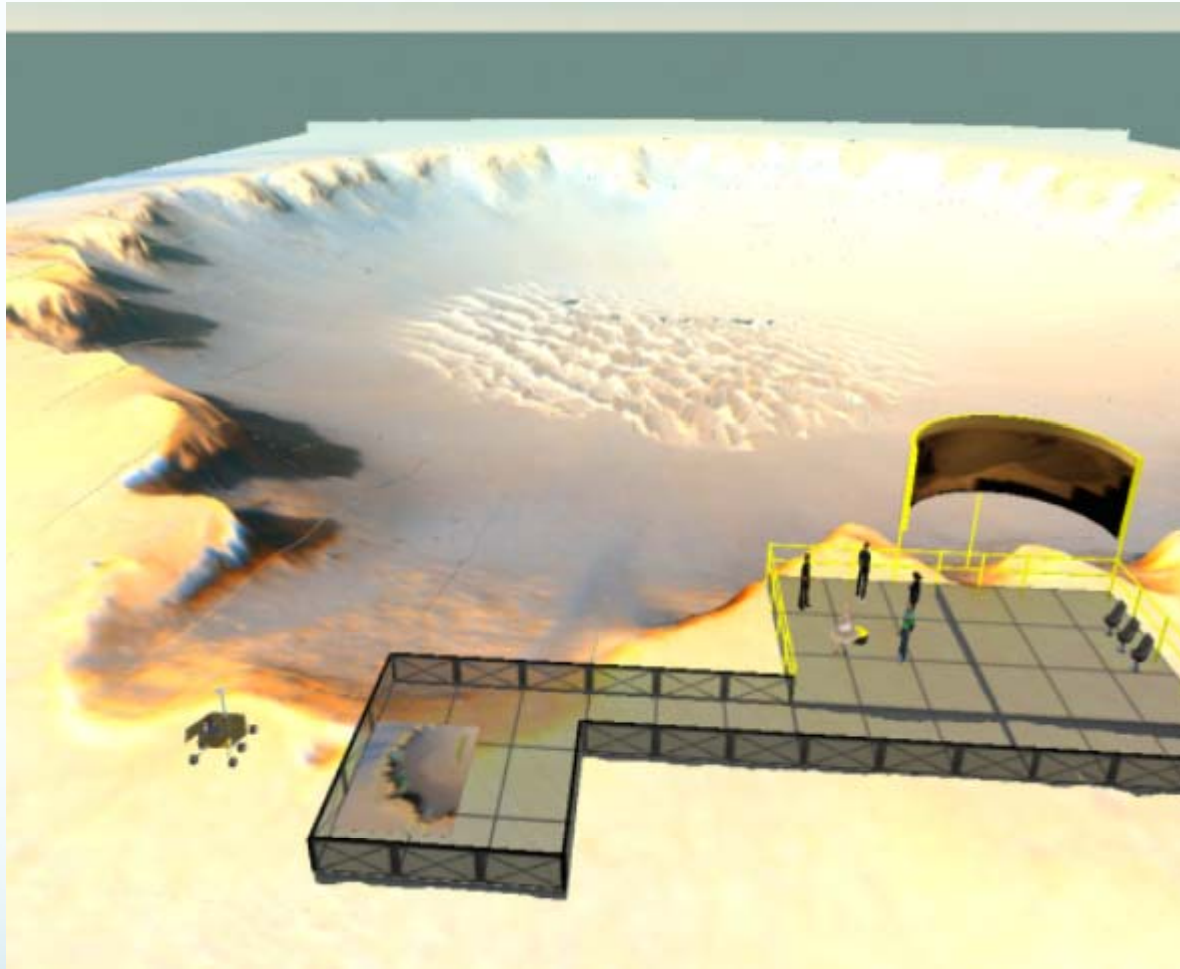
Landing Day 05.25.08  
Brent Shockley 7:20 pm  
I'm happy to report that we now  
have pictures from the  
spacecraft, downlinked through  
Mars Odyssey...

December 16, 2008



# Participatory exploration of Mars Victoria Crater

*Second Life History: First use of real science data to model actual location*



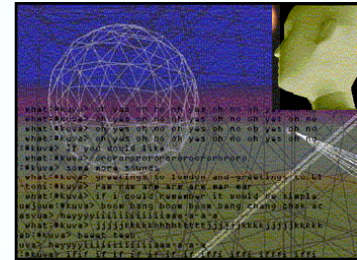
“Excuse me... I'm crying... This is wonderful!”  
-visiting avatar

# Looking Ahead

- We are working on a variety of new initiatives that are still being formulated, including
  - Agency-wide knowledge architecture
    - Update structured approach to integrating knowledge for mission success
  - Accelerating learning
    - Integrate approach to e-learning and support to the project managers
  - Supporting engineering excellence
    - Drive multi-generational learning with the NASA Engineering Network
    - Facilitate communities of practice with NESC technical experts
    - Embed lessons learned into engineering practices
  - Managing knowledge for aerospace and government
    - Work with national and international organizations to benchmark and validate approaches and to learn new methods
    - Promote standards for information and data interoperability
    - Create policies that promote sharing knowledge amongst space organisations

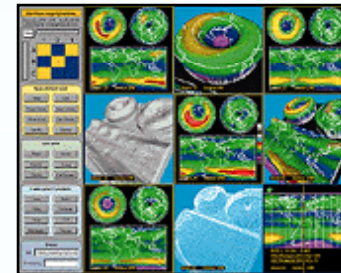


# Knowledge Management Roadmap



## Modeling Expert Knowledge

- Systems model experts' patterns and behaviors to gather knowledge implicitly
- Seamless knowledge exchange with robotic explorers
- Planetary explorers contribute to their successor's design from experience and synthesis
- Knowledge systems collaborate with experts for new research



## Capturing Knowledge

- Knowledge gathered anywhere from hand-held devices using standard formats on interplanetary Internet
- Expert systems on spacecraft analyze and upload data
- Autonomous agents operate across existing sensor and telemetry products
- Industry and academia supply spacecraft parts based on collaborative designs derived from NASA's knowledge system

## Enables real-time capture of tacit knowledge from experts on Earth and in permanent outposts

- Interstellar missions
- Permanent lunar and Martian colonies

## Enables capture of knowledge at the point of origin, human or robotic, without invasive technology

- Mars robotic outposts
- Constellation Program
- Terrestrial Planet Finder



## Integrating Distributed Knowledge

- Instrument design is semi-automatic based on knowledge repositories
- Mission software auto-instantiates based on unique mission parameters
- KM principals are part of NASA culture and supported by layered COTS products
- Remote data management allows spacecraft to self-command

## Enables seamless integration of systems throughout the world and with robotic spacecraft

## Enables sharing of essential knowledge to complete Agency tasks

- International Space Station
- MarsNet
- Mars Exploration Rovers
- Space Interferometry Mission



## Sharing Knowledge

- Adaptive knowledge infrastructure is in place
- Knowledge resources identified and shared appropriately
- Timely knowledge gets to the right person to make decisions
  - Intelligent tools for authoring through archiving
- Cohesive knowledge development between NASA, its partners, and customers

2003

2007

2010

2025

# Thanks!

- Many thanks to my colleagues on the NASA KM Team who contributed to these ideas and to the excellent work they are doing in implementing knowledge management solutions at NASA
- If you have any additional questions, contact me
  - [Jeanne.Holm@jpl.nasa.gov](mailto:Jeanne.Holm@jpl.nasa.gov) (818) 354-8282
- More information can be found about
  - NASA's KM program: <http://km.nasa.gov>
  - NASA's portal: <http://www.nasa.gov>